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RESEARCH PLAN PROPOSAL

Impact Analysis of a Nutrition and Health Education Intervention on School going children in Jaipur City

Synopsis of Research Work

IN THE FACULTY OF SCIENCE

(HOME SCIENCE)

THE IIS UNIVERSITY, JAIPUR

SEPTEMBER 2019

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INTRODUCTION

Childhood has been broadly entitled as a “golden age” accomplished with innocence, joy, and freedom. The earliest years of a child’s life determine their survival and thriving in life, and lay the foundations for their cognitive, behavioral growth and holistic development. During this stage children are highly influenced by the environment & the people that surround them. Children have unique dietary needs; In general they require less food than older children and more food than younger children. In addition it is important to consider appropriate selection of food products and food groups for proper nutrient supply to children to ensure that the required amount of nutrients are supplied in the diet (Brown & Jernigan, 2012).

It is during the early years that children develop the cognitive, physical, social and emotional skills that they need to succeed in life. These early experiences are largely determined by supportive family and community care practices, proper nutrition, health care and learning opportunities (National Association for the Education of Young Children- NAEYC, 2018).

According to Census 2011, India, with population of 121.1 Cr, has 13.59% (16.45 Cr) of its population in the age group 0-6 years and 30.76% (37.24 Cr) in age group 0-14 years. From this it can be concluded that nutrition plays a vital role in development of each child’s adequate brain functioning, optimal learning and enhancing academic performance, which starts in the womb itself and continues till late childhood (Children in India 2018- A Statistical Appraisal, 2018)

Number of researches have highlighted that undernourished preschoolers have a lower IQ, they lack socializing skills and have more behavioral problems. Their learning abilities and concentration spans are also significantly lower than their healthy counterparts. The surest way to ensure a child’s proper brain development is to provide a well-balanced diet that includes all essential vitamins, minerals, and protein foods (Charlene, 2016).

Balanced diet is essential for blossoming children for physical and cognitive development, which are important in childhood for health and well being (Kim& Kang, 2016).

The nutritional requirements of children are high in relation to their size because of the demands for growth, in addition to requirements for body maintenance and physical

activity. Trends in overweight and obesity in children and adolescents have become increasingly worrying. There is substantial evidence that poor diet and poor physical activity patterns in childhood can lead to problems that manifest later in life, particularly in relation to heart disease, obesity, type 2 diabetes, osteoporosis and some forms of cancer (Weichselbaum & Buttriss, 2011). Researches show that having a healthy; balanced diet improves brain capacity, maximizes cognitive capabilities, and improves academic performance in children. Alternatively, the researches also shows that having too much junk food and an unhealthy diet decreases academic performance by limiting the amount of information to the brain. The brain is able to both retain and recall on demand. The literature also shows the danger of not having enough nutrition and the effects of food insufficiency, which can lead to malnutrition as well as poor academic performance (Rausch, 2013).

Nutrition Transition

Developing countries are undergoing nutrition transition due to increased economic development and market globalization leading to rapid changes in lifestyle and dietary habits. The nutrition transition is characterized by a shift in disease burden from under nutrition to over nutrition-related chronic disease (Srihari et al., 2006).

Presently India is facing Dual Burden of Malnutrition, which refers to the double burden of both under as well as over nutrition occurring simultaneously within a population. Recent studies show that underweight or stunting can coexist with overweight and obesity. Industrialization and urbanization have augmented rapid socio-economic, demographic, health and nutritional transition in India. Escalating affluency and existing poverty are behaving like two sides of the coin; the outcome of which has manifested as the dual paradox throwing a challenge at the country's health sector. The market liberalization has immensely affected dietary patterns, which has spurred up the "double burden" (Giri &Nambiar, 2016).

According to WHO, the double burden of malnutrition is characterized by the coexistence of under nutrition along with overweight and obesity, or diet-related non-communicable diseases, within individuals, households and populations, and across the life course. Childhood obesity is one of the most serious public health challenges of the 21st century.

The problem is global and is steadily affecting many low- and middle-income countries, particularly in urban settings is increasing at an alarming rate. Moreover, the relationship between under nutrition and overweight and obesity is more than coexistence. Reflected in the epidemiology and supported by evidence, under nutrition early in life – and even in utero – may predispose to overweight and non-communicable diseases such as diabetes and heart disease later in life (WHO, 2017).

India is country in developmental transition and hence faces the dual burden of pre-transition diseases like under nutrition and infectious diseases as well as post-transition, lifestyle-related degenerative diseases such as obesity, diabetes, hypertension, cardiovascular diseases and cancers. According to National Family Health Survey (NFHS-3 2005-2006) and UNICEF Reports (2000), 46% of preschool children in India suffer from moderate and severe grades of protein-calorie malnutrition as judged by anthropometric indicators (Das & Bose, 2011).

In India, approximately 19% (190 million) of the growing population comprises school-aged children of whom 30% (48 million) currently reside in urban India. A significant increase in prevalence of overweight and obesity and micronutrient deficiencies is observed among children belonging to middle and high-income groups (Srihari et al., 2007).

As the transition advances, traditional diets high in complex carbohydrates and fiber are replaced with diets high in fats and sweeteners. Physical activity levels decline and sedentary time increases. Increased consumption of energy-dense foods and the lack of physical activity lead to obesity and the development of numerous chronic diseases. Obesity and related chronic diseases were once considered diseases of affluent Western societies; however, as a country's gross national product (GNP) increases, the burden of obesity shifts to lower socioeconomic groups (Tzioumis & Adair, 2014).

Globally, in 2016 the number of overweight and obese children under the age of 5, is estimated to be over 41 million. Almost half of all overweight children under 5 lived in Asia. Overweight and obese children are likely to stay obese during adulthood too and more likely to develop non-communicable diseases like diabetes and cardiovascular diseases at a younger age. Overweight and obesity, as well as their related diseases, are

largely preventable and is recommended to be prioritized. Prevention of childhood obesity therefore needs high priority (WHO, Childhood Overweight and Obesity, 2017).

Researches have reported that prevalence of childhood over nutrition is rising in many developing countries including India in recent decades ranging from 2.9% to 14.3% which makes our youth vulnerable to many life- threatening consequences. Childhood is the best time to determine the nutritional status and take action accordingly because this is the most fertile period of one's life when seeding of proper dietary habits and nutritional advice will bloom throughout life improving the total health of the whole nation. Therefore, early childhood is now recognized as a key target in the prevention of overweight and obesity, and the knowledge that children gain at this time about food and its health benefits can influence their dietary choices and preferences in later life. Parental attitude and their perception about child eating behaviour helps children to inculcate correct knowledge regarding healthy food. Changing trends of dietary habits and lack of physical exercise force the world to face a modern era epidemic obesity. So, childhood obesity is now a challenge of public health to combat with (Dasgupta et al., 2017).

Underweight and obesity are both among the top ten leading risk factors for the global burden of disease. Over the last two decades chronic non-communicable diseases have taken over the communicable diseases thereby making it as a major public health problem, especially in the urban areas (Giri et al., 2016).

In 2010, 43 million children under five were overweight or obese, with an additional 93 million children at risk of overweight. Global prevalence of overweight or obesity increased in all regions, from 4.2% in 1990 to 6.7% in 2010. Although the prevalence is higher in developed countries, developing countries have greater absolute numbers of affected children and higher relative increases. These increasing trends are projected to continue, with 60 million children under five expected to be overweight or obese in 2020. Prevalence of overweight and obesity was found to be highest among children who consumed junk food on weekly basis and had habit of snacking between meals. Unhealthy lifestyle and habits developed at young age are responsible for predisposition to adulthood chronic diseases. It is the cumulative effect of several factors existing in the physical

environment that are responsible for bringing in vitro (Giri et al., 2016).

The level of physical activity, its frequency, duration, intensity, type and total amount, as well as the time spent sedentary have a major impact on health at all stages of life. There is concern that many children spend too much time undertaking sedentary activity. This aspect has been identified as the fourth leading risk factor for global mortality (6% of deaths globally).Physical activity has a major impact on health at all stages of life. Among children and young people it is particularly important to maintain energy balance by ensuring a healthy bodyweight, for appropriate bone and muscoskeletal development, for reducing the risk of diabetes and hypertension, and for numerous psychological and social aspects. There is concern that many children spend too much time engaged in sedentary activity and not enough time in being active. Overweight and obese children are not only at risk for insulin resistance syndrome, hypertension, dyslipidemia and hypertriglyceridemia, but also for poor micronutrient status. Reports from countries such as the United States, Israel and Canada have shown that overweight and obese children have a higher prevalence of iron deficiency than normal weight children and intakes of other micronutrients such as folate, vitamin D, calcium, magnesium and vitamin E are sub-optimal among obese children. Moreover, micronutrient deficiencies appear to be prevalent even among non-obese, well nourished, school aged children, and are likely to be caused by a high intake of energy-dense foods that do not contain vitamins and minerals. Inadequate intake of micronutrients can adversely influence growth and development, cognitive performance and increase susceptibility to infections. Overweight and obesity are responsible for 5% of global mortality (WHO, 2009).

Causes of childhood obesity include environmental, behavioral and personal factors that often act in combination. Environmental factors include life at home, parenting style, peer influence and school/community setting. Behavior factors involve one’s choice of foods and food acceptance, whereas personal factors include nutrition knowledge, which influences an individual’s confidence in performing a particular behaviour and overcoming barriers to that behaviour. Through nutrition education improvement in youth’s dietary habits will reinforce beneficial long term nutrition behaviour to effectively protect against excessive weight gain and future development of obesity related disease

(Rolling &Hong , 2016).

Nutrition Education

Nutrition Education is basically education about food which plays an essential role in yielding greater understanding and acquaintance of value of nutrition which in turns help an individual in fostering a healthy lifestyle. Nutrition Education Theories may bridge the gap between motivation for change and behavior change. Bridging the gap between motivation and behavior change is especially important in nutrition education interventions programs and researches have suggested that these nutrition education programs have been successful (Kupolati, 2018).

Monalisa in 2016 conducted a research to assess the effect of nutrition education and dietary modification on the health and nutritional status of 104 kindergarten children. Nutrition education and dietary modification workshop of 45 minutes for 5 days a week were intervened among the experimental group for a month whereas the controls were kept on casual daily routine. After one month of follow-up, the second primary data including the anthropometric and dietary changes among both the groups were noted and compared. Number of cases taking optimal nutritional intake increased by 74% after the trial period of one month.

Hu et al. in 2009 evaluated the impact of nutrition education promotion and healthy dietary habits in children with four kindergartens with 1252 children randomized to the intervention group and three with 850 children to the control group. The personal nutritional knowledge, attitudes and dietary behaviours of the parents were investigated. Each month, children and parents in the intervention group participated in nutrition education activities. The main outcome measures were anthropometrics and diet-related behaviours of the children and the nutritional knowledge and attitudes of the parents at baseline, 6 months (mid-term) and 1 year (post-test). Baseline demographic and socio-economic characteristics were also collected. Results indicated that the prevalence of children's unhealthy diet-related behaviours decreased significantly and good lifestyle behaviours increased in the group receiving nutrition education compared with controls. Parental eating habits and attitudes to planning their children's diets also changed

appreciably in the intervention group compared with the control group (P,0.05). However, there were no statistically significant differences in children's height, weight, height-for-age Z-score or weight-for-age Z-score between the two groups.

Sato et al., 2016 developed a nutrition education programmeto improve children's chewing habits. Four kindergarten classes in Japan (150 children, aged 5-6 years) were studied; one class received the educational program in the classroom and at home (Group A) and three classes received the program in the classroom only (Group B). The educational program was integrated into the classes' daily curriculum for five weeks. It included storytelling with large picture books, chewing consciously while eating lunch, singing a song with gestures, and greetings before and after meals (both groups). Group A also used a paper textbook and was provided information by the leaflet to encourage guardians to implement the program at home. Chewing habits before and after intervention were evaluated. Research concluded that this intervention could be used to improve chewing habits in young children even without active involvement of their guardians.

A study was conducted to determine changes in nutrition knowledge, attitude and practice of 8-year-old school children after receiving a nutrition education package. A total of 418 school children from urban and rural areas participated in this study. The intervention group consisted of 237 children while 181 children who did not receive the nutrition education package acted as controls. The nutrition education programme that was conducted for 3 weeks comprised of a video viewing session and a comic reading session followed by exercise questions as reinforcement for each session, and also classroom activities. Knowledge, attitude and practice questionnaires were distributed to the children before (pre-intervention) and after (postintervention) receiving the nutrition education programme. A follow-up visit was conducted six months after the programme had elapsed. The results obtained indicated that the nutrition knowledge score increased significantly in the intervention group from 48.3±13.2 at pre-test to 54.6±16.2 in post-test and 55.0±14.3 in follow-up test ($p<0.05$). The nutrition attitude score also increased significantly from 68.7±15.5 at pre-intervention to 72.6±15.0 and 74.7±15.8 during post-test and follow-up test respectively ($p<0.05$). However, the nutrition practice score had no significant improvement in both groups throughout the study period. There were no significant

changes in the control group in knowledge, attitude and practice scores at pre, post and follow-up tests. In conclusion, this study showed that a good nutrition education programme had a positive impact whereby better nutrition knowledge, attitude and healthy eating habits in children were seen. It is hoped that the improvements would be sustained throughout their lives (Talib et al., 2007).

Significance of Study

Industrialization and urbanization have augmented rapid socio-economic, demographic, health and nutritional transition in India. A complex interaction of genetic, environmental and behavioral factor has amplified over nutrition (45% overweight and 42% obesity) and related morbidities among children in the developing countries (Giri & Nambir,2016).The International Obesity Taskforce (IOTF) in the year 2000estimates the global prevalence of overweight and obesity in school-aged children to be 10% (Ahmad et al., 2010). The co-morbidities of excess weight and the impact on the healthcare system indicate that obesity is a significant public health issue. Childhood obesity increases the risk of obesity and related morbidities during adulthood (Goyal et al., 2010). Wide spreading obesity among young school going children could be best tackled if the risk factors are analyzed well in advance. Therefore emphasis needs to be laid on prevention programs targeting behavioral modifications (Singh, 2010). Parents, health professional, teachers and other school officials need to work together to combat this "epidemic".

The first few years of a child's life, may be the optimal window for promoting the development of healthy eating behaviours in children. Children's food preferences are also influenced by availability, accessibility, and familiarity to foods as well as parental modeling. Thus, if children are to learn to prefer and select healthy foods, they need early, positive, repeated experiences with those foods (Birch et al., 2009). Early childhood development pertains to physical, mental and social growth and consists of various interventions, such as those involving the promotion of nutrition, health and mental and social development. Children develop many food and nutrition- related attitudes, behaviours and preferences during their pre school years. Reduced physical activity, snacking between the meals, consuming calorie dense and nutrient deficient food, frequently eating out of house are ostensible contributors of childhood obesity especially among affluent families. With changing physical environment the preferences among young children have also changed. Lack of playing space, inadequate time for sports have increased the inclination towards screen time and simultaneous reduced their involvement in active outdoor sports. Moreover, media marketing, easy accessibility and affordability of unhealthy food choices have influenced the food preference; thus increasing pediatric obesity (Giri & Nambir, 2016).

Children also learn about food by observing the eating behaviours modeled by others. Therefore development of the family's dietary environment plays an important role in the health of the next generation. Parents have a strong influence on food availability and dietary practices from infancy through to adolescence. It is crucial that both children and parents are educated in good dietary practices when the children are in school age and good dietary habits because of behaviours formed at this time will persist and therefore benefit children until they fully grown. Parents and teachers play key roles in helping children to develop positive dietary behaviours (Chuanlai , 2009). The school environment can also help to teach children about dietary patterns and eating behaviours (Birch et al., 2009).

From this it can be interpreted that education related to Nutritional and behavioral aspect plays a vital role in bringing about a greater awareness of the value nutrition has in adopting a healthy lifestyle. Education is transformative, providing knowledge through instruction that first acts upon the attitudes of a person and then goes on to influence their behavior. The earlier this process begins, the more effective it is (Hulya et al., 2015). Parent and caregiver behaviour related to child feeding practices should be targeted by education, prevention and intervention efforts. Children's eating behaviours are susceptible to many external influences within their families, schools and communities. Currently, many of these influences promote dietary patterns that predispose to obesity. Fortunately, these influences can also act to promote healthy dietary practices (Birch et al., 2009).

Hence, public health interventions are warranted to combat this increasing epidemic. If the present trend of overweight/obesity continues, it may emerge as the single most important public health problem in children (Giri & Nambir ,2016). Furthermore, the evidence base for interventions aiming to prevent childhood obesity, particularly in community settings, is limited (Wilson et al., 2008).

Therefore the present research has been planned with an aim to analyze impact of nutritional and health based educational intervention on knowledge level of parents and knowledge, attitude and practices of school age children residing in Jaipur city.

OBJECTIVES

- To collect information related to demographics and nutritional status of children.
- To assess Nutritional Knowledge, Attitude and Practices of caretakers and children.
- To impart need based Nutrition and Health Education Intervention based on the Information collected.
- To assess impact of Nutrition and Health Education Intervention on both caretakers and children.

METHODOLOGY

This chapter of study is mainly concerned with the methodological aspects pertaining to the present investigation. The design of the study refers to the logical manner in which units of study will be assessed and analyzed for the purpose of the drawing conclusions.

The present study will be carried out in four phases:

PHASE I- Pre Intervention Phase

A) Demographic Information

- Locale of the Study
  - Area Selection
  - Sample Selection
  - General Information

B) Assessment of Nutritional Status

- Anthropometry Measurements
  - -Height
  - -Weight
  - -Weight for age
  - -Height for age
  - -Calculation of Body Mass Index
- Qualitative Assessment of Dietary Intake
  - -Food Frequency Questionnaire
- Morbidity Data

C) **Development and Validation of Survey Instrument**

- **For Caretakers**

  -Nutrition Knowledge Questionnaire

  - Attitude Questionnaire

  - Practices Questionnaire

- **For Children:**

  - Nutrition Knowledge Questionnaire

  - Attitude Questionnaire

  - Practices Questionnaire

PHASE II- Intervention Phase

- Designing of a Tailored Nutrition Education Intervention Campaign for Children and Caretakers
- Implementation of campaign for 8 weeks

Phase III – Post Intervention Phase

- **Impact Analysis of Nutrition Education Intervention For Caretakers**

  -Nutrition Knowledge Questionnaire

  - Attitude Questionnaire

  - Practices Questionnaire

- **Impact Analysis of Nutrition Education Intervention For Children**

  - Nutrition Knowledge Questionnaire

  - Attitude Questionnaire

  - Practices Questionnaire

Phase IV- Follow Up Study

- **For Caretakers**

  -Nutrition Knowledge Questionnaire

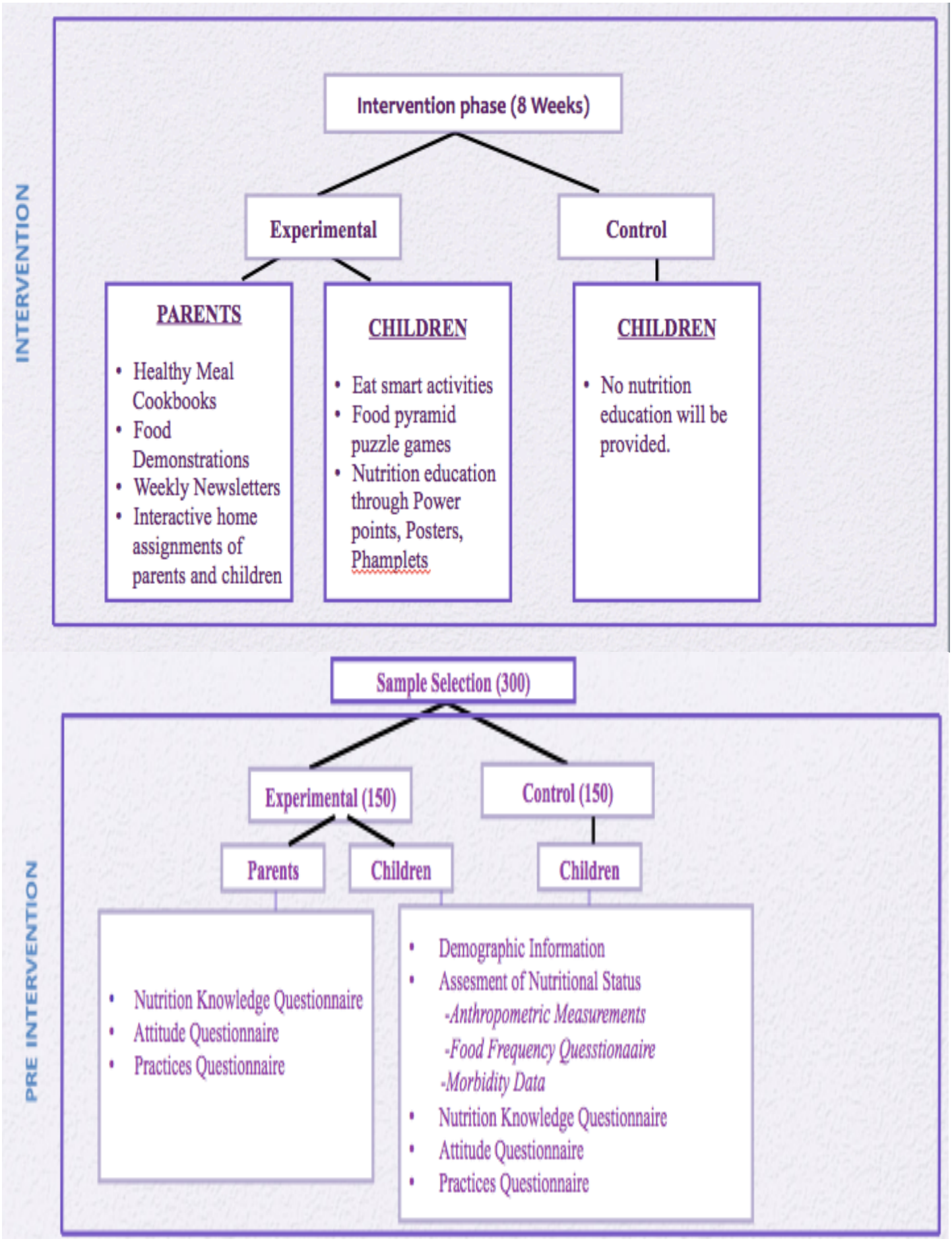
  - Attitude Questionnaire

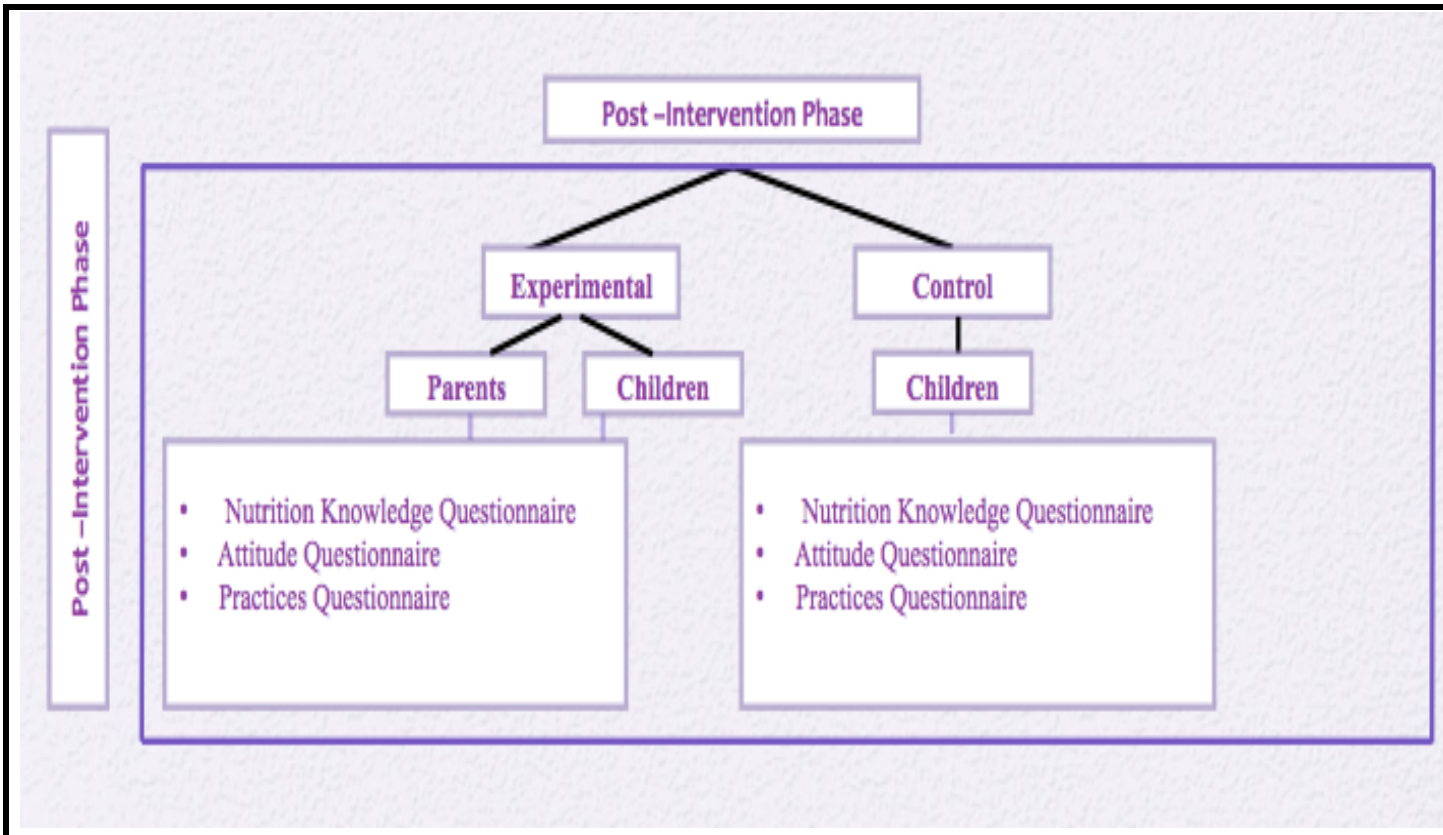
  - Practices Questionnaire

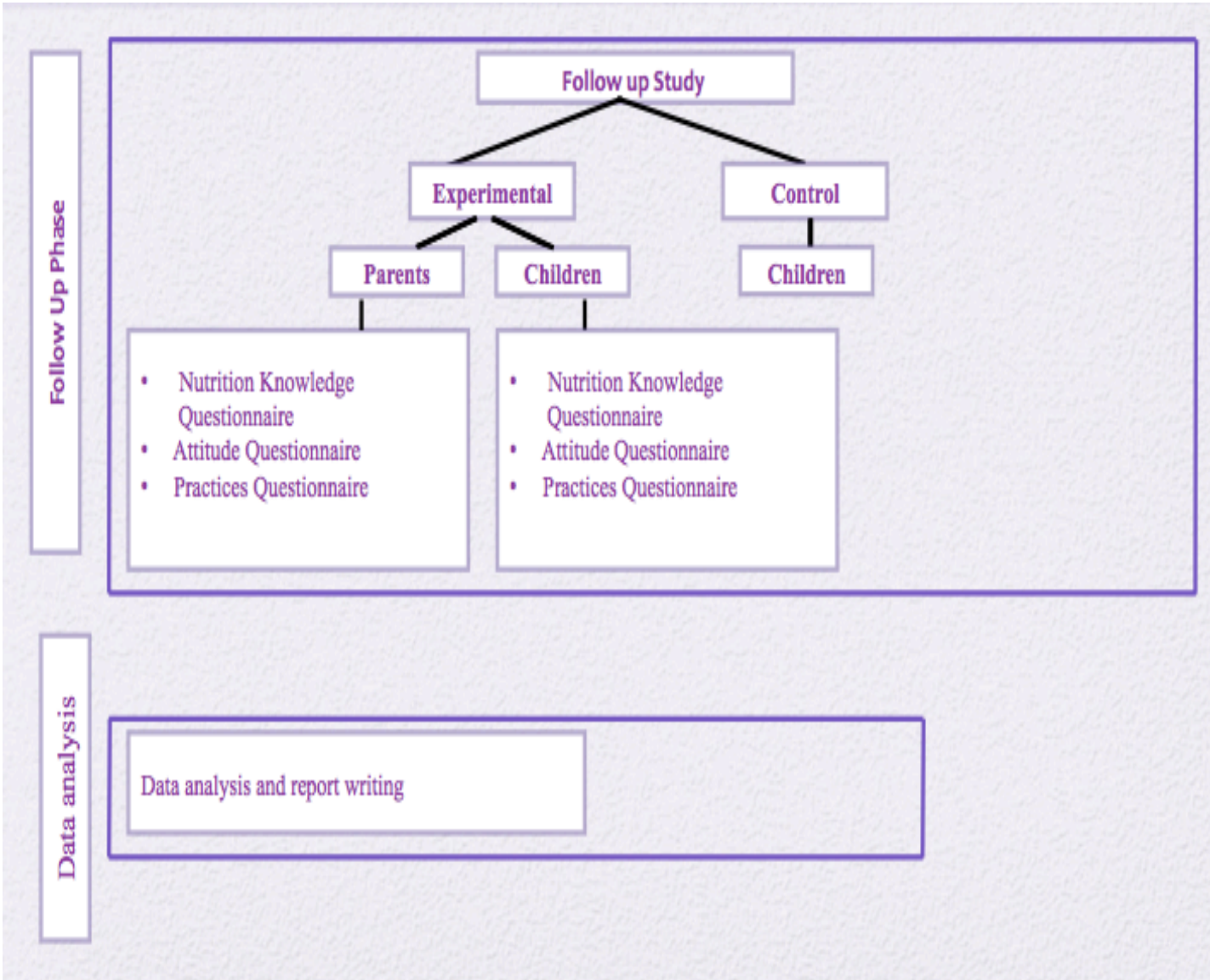
- **For Children:**
  - Nutrition Knowledge Questionnaire
  - Attitude Questionnaire
  - Practices Questionnaire

Phase V- Data analysis and report writing

Research Design




Post –Intervention Phase
Post –Intervention Phase
Experimental
Control
Parents
Children
Children
Nutrition Knowledge Questionnaire
Attitude Questionnaire
Practices Questionnaire
Nutrition Knowledge Questionnaire
Attitude Questionnaire
Practices Questionnaire


Follow Up Phase
Follow up Study
Experimental
Control
Parents
Children
Children
Nutrition Knowledge Questionnaire
Attitude Questionnaire
Practices Questionnaire
Nutrition Knowledge Questionnaire
Attitude Questionnaire
Practices Questionnaire
Data analysis
Data analysis and report writing

PHASE I- (Pre Intervention)

A) Demographic Information

- **Locale of the study**

-Area Selection

Present study will be conducted in Jaipur city. According to the information provided by Jaipur Municipal Corporation, 2019 of Jaipur city (Rajasthan). The city has been divided into 8 zones MotiDungri, HawaMahal, East, HawaMahal West, Vidyadhar Nagar, Civil Line, Sanganer, Amber and Mansarovar Zone.Form this we have shortlistied two zones 1) MotiDungri and 2) Mansarovar on the basis of convenient sampling according to easy approachability and good connectivity. These two zones have 19 wards in total.

- MotiDungri Zone comprises 11 wards No. 35, 38, 39, and 44 to 51.
- MansarovarZone comprises 8 wards No. 23 to 29, and 40.

Out of 19 wards we selected 5 wards purposely.We surveyed these 5 wards and prepared a list of all government recognized schools providing education to children and shortlisted three schools on the basis of below mentioned criteria:

Inclusion criteria

- The schools should follow English as medium of instruction.
- The schools should have coeducation system of education.
- The schools should be catering to children belonging to same socio economic status.
- Strength of students should be above 200.
- Fee structures should be above 35000 pa.
- A written consent from management for cooperation.

-Sample Selection

An interventional study will be conducted in the shortlisted schools on children aged between 5-6 years. The school principle, teachers and parents of the students will be approached; project objective will be explained to them. Initially group meetings and interactive sessions will be held in order to develop good rapport with the subjects. Finally

all those children who meet the criteria and are willing to participate will be enrolled for study.

Inclusion criteria

- The age should be between 5-6 years.
- The subjects should be regular in school.
- Subjects should be free from morbidities.
- Subjects should cooperate and be a part of research.
- Written Consent of parents

Subjects will be asked to fill consent form before proceeding with data collection. The data will be collected using semi-structured questionnaires, standard tools and techniques.

After shortlisting the schools and obtaining consent from management we will randomly divide schools into control and experimental category. The sample size will consist approximately 350 subjects, 150 in experimental category and 150 will serve as controls in order to ensure stastical validity of results. Baseline of information will be obtained from all the students (both control and experimental category) however the students of school kept in control category will just receive education material to read but the students belonging to experimental category will be enrolled in a formal 8 week Intervention Campaign.

-General Information

The general information of the subjects will be collected by structured questionnaire developed and pre tested which will include age, parental educational qualification, gender, religion, per capita income, family size and type, dietary patterns etc.

B) Assessment of Nutritional Status

Three parameters will be used to evaluate the nutritional status of the children; anthropometric measurements (weight and height) to calculate Body Mass Index (BMI), weight for age and height for age using cutoffs suggested by WHO, 2010. Morbidity pattern will be recorded with help of parents to obtain information about episodes of illness and infections of past one month and Food Frequency Questionnaire (FFQ) will be filled up to assess child's habitual food indicate just for analyzing qualitative aspect of food intake.

• **Anthropometry Measurements**

Anthropometry is the most direct method for the assessment of wide spread nutritional problems in the world. Nutritional anthropometry is measurement of human body at various ages and levels of nutritional status. It is based on the concept that an appreciable measurement should reflect any morphological variation occurring due to a significant functional physiological state.

- **Weight:** It is the most widely used and the simplest reproducible anthropometric measurement. It indicates the body mass and is a composite of all body constituents like water, minerals, fat, protein, bone etc.

Technique (Jelliffe, 1966)**:**

A weighing balance will be used for measuring weight. The balance will be calibrated using standard weight after taking weight of every 3rd subject. The zero error of the weighing scale will be checked before taking the weight and corrected as required. The subject will be asked to stand on the platform bare feet, with minimum clothing and without leaning against or holding anything. The measurements will be taken to the nearest of 0.5 kg.

- **Height:** It is a linear measurement made up of the sum of four components, i.e., Legs, Pelvis, Spine and Skull (Jelliffe, 1966).

Technique (Cameron et al., 1978)**:**

The height of each subject will be measured using vertical anthropometric rod. The subject will be asked to stand erect looking straight on a leveled surface without shoes, with heels together and toes apart. The anthropometric rod will be placed behind the subject in the center of the heels perpendicular to the ground in such a way that the rod passes vertically between the buttocks touching the back of the head. The investigator stood on subject left side and firmly held the chin of the subject with her/his left hand and the occiput with her/his right little finger in the Frankfurt horizontal plane (an imaginary line joining the tragus of the ear and the eye), moving the headpiece of the sagittal plane over the head of the subject applying a slight pressure to reduce the thickness of the hair. The reading will be noted to the nearest of 0.1 cm.

In children the most commonly used anthropometric indices to assess their growth status are height-for-age and weight-for-age. These anthropometric indices can be interpreted as follows:

- **Height for Age**

Stunted growth reflects a process of failure to reach linear growth potential as a result of suboptimal health and/or nutritional conditions. On a population basis, high levels of stunting are associated with poor socioeconomic conditions and increased risk of frequent and early exposure to adverse conditions such as illness and/or inappropriate feeding practices. The worldwide variation of the prevalence of low height-for-age is considerable, ranging from 5% to 65% among the less developed countries.

- **Weight for Age**

Weight-for-age reflects body mass relative to chronological age. It is influenced by both the height of the child (height-for-age) and his or her weight (weight-for-height), and its composite nature makes interpretation complex. For example, weight-for-age fails to distinguish between short children of adequate body weight and tall, thin children. However, in the absence of significant wasting in a community, similar information is provided by weight-for-age and height-for-age, in that both reflect the long-term health and nutritional experience of the individual or population.

The WHO recommends the use of SD classification (WHO 1983) to categorize the children into different grades of nutritional status. Distribution of preschool children is carried out using WHO-MGRS reference values, as provided below:

SD Classification	Weight for age	Height for age
>Median-2SD	Normal	Normal
<Median-2SD to <Median -3SD	Moderate Stunting	Moderate wasting
<Median -3SD	Severe Stunting	Severe Wasting

Source: Bamji et al., 2016

- **Body mass index (BMI)**

  The Body Mass Index defines the level of adiposity according to the relation of weight to height. It estimates the dependence on frame size. The body mass index is the relative weight index that shows highest correlation which independent measures of body fat (Skills, 1994).

Technique BMI (Bamji et al., 2016)

The body weight and height will be taken as described above. To obtain the body mass index, weight in kg will be divided by square of height in meter square as given below**:**

Body mass index (BMI) (kg/m²) = Weight (kg)/ Height (m²)

BMI of <5thpercentile for age and gender is considered as undernourished, between 5th and 85thpercentiles as normal, between 85th and 95th percentile as overweight and more than 95thpercentile considered as obese. The age and sex specific percentile values are presented in table below:

Category	Classification
<5th percentile	Undernourished
5th and 85th percentiles	Overweight
95th percentile	Obese

Source:WHO- Bamji et al., 2016

- **Food Frequency Questionnaire for qualitative assessment of dietary intake of children**

A food frequency questionnaire will be given to the mothers of children. It will consist of given a list of different food items to indicate his or her child's intake (frequency and quantity). In this list mentioned mothers will be asked to record frequency of consumption like per day, 4 to 5 times per week, 2 to 3 times per week, once a week, 2 to 3 times a month and rarely of their child. Portion sizes are also asked by the subjects and converted to weights in grams. A FFQ is common method used to assess individual long term dietary intake of foods and nutrients. The questionnaire elicits a subjectivity recorded "usual frequency" of consuming an item from a list

of foods. The recall responses will be transformed to the average nutrient intake per day using food composition tables.

The food frequency questionnaire will contain questions about food groups (milk and dairy products, meat and related products, vegetables, fruits, cereals, fats/desserts, and beverages) and aims to determine the child's food consumption status (Baysal, 2002). Those who ate a particular food every day will be awarded 5 points, those eating it three to five times a week will be awarded 4 points, those who ate it one to two times a week will be awarded 3 points, those who ate it every 15 days will be awarded 2 points, those who ate the food once a month will be awarded 1 point, while those who never ate it will be awarded 0 points. Rising scores will indicate that the child's food consumption is more. Parents will complete the form prior to the education, following the education, and 1 month after the education to check the retention.

- **Morbidity Data**

A structured questionnaire will be formulated to be administered by parents of children between 5-6 years of age to obtain information about common morbidity conditions like infections, fevers , diarrhea, conjunctivitis and malaria.

The questionnaire will include similar morbidity questions related on asthma and jaundice, fever, diarrhea along with episodes of illness and infections and acute respiratory infection, primarily pneumonia, which is a major cause of illness among children and the leading cause of childhood mortality throughout the world (Murray & Lopez, 1996).

C) Development and Validation of Survey Instrument

- **For Caretakers**

  - Nutrition Knowledge Questionnaire

Knowledge is defined as the fact or condition of being aware of familiar of something and one of the most suitable method of assessing the knowledge is by developing questionnaire or schedules. Hence, in the present research a Nutrition Knowledge questionnaire will be developed and validated by a team of experts. Through questionnaire we will try to evaluate knowledge levels of subjects. It will be close ended in nature in which respondents will be given options from which they will select appropriate answers. Each right answer will be awarded 1 point while each wrong answer was awarded 0.

Nutrition knowledge of caretakers will be assessed by asking questions for example:

- ✓ Which of these foods has the most trans-fat?
  a) Biscuits b) Cakes &pastries c) Burger d) Chips

- ✓ Which is the best source of Iron?
  a) Spinach b) Almond c) Jaggery d) Milk

-Attitude Questionnaire

Attitude is a mental position with regard to a fact or state. In the present research responded attitude or personal feeling will be assessed using likerat scale in which we will try to evaluate degree of agreement by giving them options like strongly agree, agree, neutral, disagree and strongly disagree.

Nutrition related attitude of the caretakers will be assessed by asking questions like:

- ✓ Do you think eating lot of carbohydrates can lead to obesity?
  a) Strongly agree
  b) Agree
  c) Neither agree/Nor disagree
  d) Disagree
  e) Strongly disagree

- ✓ Do you think green leafy vegetables are rich in protein ?
  a) Strongly agree
  b) Agree
  c) Neither agree/Nor disagree
  d) Disagree
  e) Strongly disagree

-Practices Questionnaire

Practice is usual way of doing something. Nutritional practices can be assessed using structured questionnaire as well as observational method. In the present research we will be designing a questionnaire for assessing nutritional practices of caretakers.

The questionnaire will be having options never, rarely, sometimes, often, always with scoring of 1,2,3,4, and 5 respectively. The questionnaire will be targeted to check individuals food related practices like his/her food responsiveness, emotional overeating, enjoyment of food, satiety responsiveness etc.

Practice related attitude of the caretakers will be assessed by asking questions like:

- ✓ Do you pack lunchbox for your child everyday?
  a) Never b) Rarely c) Sometimes d) Often e) Always

- ✓ Do you cook green leafy vegetables thrice a week?
  a) Never b) Rarely c) Sometimes d) Often e) Always

- **For Children**

  Assessment of knowledge attitude and practices related to Nutrition and health of children will be done.

-Nutrition Knowledge Questionnaire

It will be developed and validated in similar way as mentioned above.

Nutrition knowledge of the child will be assessed by asking questions for example:

- ✓ Choose the food group that you should eat the MOST every day?
  a) Fats b) Fruits & Vegetables c) Junk Food d) Cold Drink

- ✓ Choose the food group that gives your body the best ENERGY?
  a) Milk b) Chocolate c) Fruit d) Pizza

-Attitude Questionnaire

Nutrition related attitude of the child will be assessed by asking questions like :

- ✓ Do you think eating lot of sweets can damage your teeth?
  a) Strongly agree
  b) Agree
  c) Neither agree/Nor disagree
  d) Disagree

e) Strongly disagree

- ✓ Do you think Cold drinks contains high levels of sugar ?

  a) Strongly agree

  b) Agree

  c) Neither agree/Nor disagree

  d) Disagree

  e) Strongly disagree

-Practices Questionnaire

Practice is usual way of doing something. Nutritional practices can be assessed using structured questionnaire as well as observational method. In the present research we will be designing a questionnaire for assessing nutritional practices of children.

The questionnaire will be having options never, rarely, sometimes, often, always with scoring of 1,2,3,4, and 5 respectively. The questionnaire will be targeted to check individuals food related practices like his/her food responsiveness, emotional overeating, enjoyment of food, satiety responsiveness etc.

Practice related attitude of the child will be assessed by asking questions like:

- ✓ Do you consume green vegetables daily?

  a) Never b) Rarely c) Sometimes d) Often e) Always

- ✓ How often do you consume breakfast ?

  a) Never b) Rarely c) Sometimes d) Often e) Always

Pilot Testing: A pilot survey will be carried out to test the appropriateness on 10% of the sample size and thereby refine the survey instruments.

PHASE II- Intervention Phase

- ✓ **Designing and Implementation of a Tailored Nutrition Education Intervention Campaign**

All intervention activity and material will be prepared specifically for the study, and will undergo a validation process before being used in the intervention. Health

messages will be prepared and determined through the sessions of lectures, discussions, demonstrations and IEC materials like power point presentations, documentaries, charts, posters, leaflets, games, puzzles, pamphlets etc. These messages will be focused on some nutrition topics like food groups, balanced diet, food pyramid, importance of micronutrients, health risk related to obesity as well as topics related to health aspects, personal hygiene, immunization and physical activity.

-Caretakers

The parents of the children will be approached through Parent Teacher meetings and certain Nutrition Education Material will be distributed such as:

- ✓ Healthy meal cookbooks
- ✓ Food Demonstrations
- ✓ Parents received weekly newsletters mirroring the children's curriculum.
- ✓ Interactive homework assignments between parents and children.
- ✓ Practice of reading Nutrition Labels

-Children

The designed educational campaign will be implemented for duration of 8 weeks.

An 8-week intervention campaign will be designed for children in experimental category. Two sessions per week will be organizes and each session will be of 60 minutes duration. Hence the total contact hours will be 2hrs/week i.e. 16 hrs for 8 weeks.

Several activities will be organized during intervention phase based on topics related to Nutrition Health as well as Physical activities as per the information collected through the survey instrument.

Examples of certain activities to be organized include:

- ✓ Drawing and coloring the favorite food
- ✓ Fruit basket game
- ✓ Reading stories about food
- ✓ Completing the food pyramid puzzle (cereal and milk groups)
- ✓ Coloring the cereal and milk groups pictures- Attaching the colored pictures to suitable places on the food pyramid
- ✓ Asking about the known fruit and vegetable names : Showing healthy-unhealthy and underweight-overweight children and asking the causes

- ✓ Showing a picture of a beautiful child with rotten teeth and asking about the reasons -Asking about the foods that make bones and teeth stronger
- ✓ Eat smart activities

- **Implementation of campaign for 8 weeks**

After developing a good rapport with subjects who are willing to participate in the study. Conduction of some informal introductory classes and quiz session for a week will be done so that they become to join the intervention sessions which will be organized in the school premises itself once in a week. The educational talk will be conducted for 60 minutes by using developed IEC materials. It will be followed by a 15 minute question and answer session in which the children will be motivated to participate actively. Besides these educational sessions, some interesting topics will be discussed as per their interest and some informal talks on comic books, favorite cartoon characters and comedy shows will also be discussed so that they become interested to give their full participation and this will help to build a good rapport with them. Quiz competitions will be conducted and children who will win, they will get incentives or prizes like wafers, chocolates, pencil, clips etc.

Phase III – Post Intervention Phase

- **Impact Analysis of Nutrition Education Intervention For Parents**

- Nutrition Knowledge Questionnaire
- Attitude Questionnaire
- Practices Questionnaire

- **Impact Analysis of Nutrition Education Intervention For Children**
  - Nutrition Knowledge Questionnaire
  - Attitude Questionnaire
  - Practices Questionnaire

After completion of 8 weeks of intervention the impact assessment of the programme will be done using the same Survey Instrument which was used and for assessing qualitative improvement in dietary intake, the same food frequency questionnaire will be used which was used initially.

Phase IV- Follow Up Study

- **Impact Analysis of Nutrition Education Intervention For Caretakers**

- Nutrition Knowledge Questionnaire
- Attitude Questionnaire
- Practices Questionnaire

- **Impact Analysis of Nutrition Education Intervention For Children**
  - Nutrition Knowledge Questionnaire
  - Attitude Questionnaire
  - Practices Questionnaire

After assessing the impact of educational intervention, follow up study will be taken up after 1 month for checking the sustainability of the intervention program using same Survey Instrument designed for both caretakers and children. So that we can assess that they have adapted those practices for their life time.

Phase V- Data analysis and report writing

After intervention, the assessment of data will be done. The responses in the questionnaires will be entered and analysis will be done. The data will be expressed in percentages, Annova test will be used to calculate results. SPSS will be used for data analysis. The level of significance will be considered at p value<0.05.

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